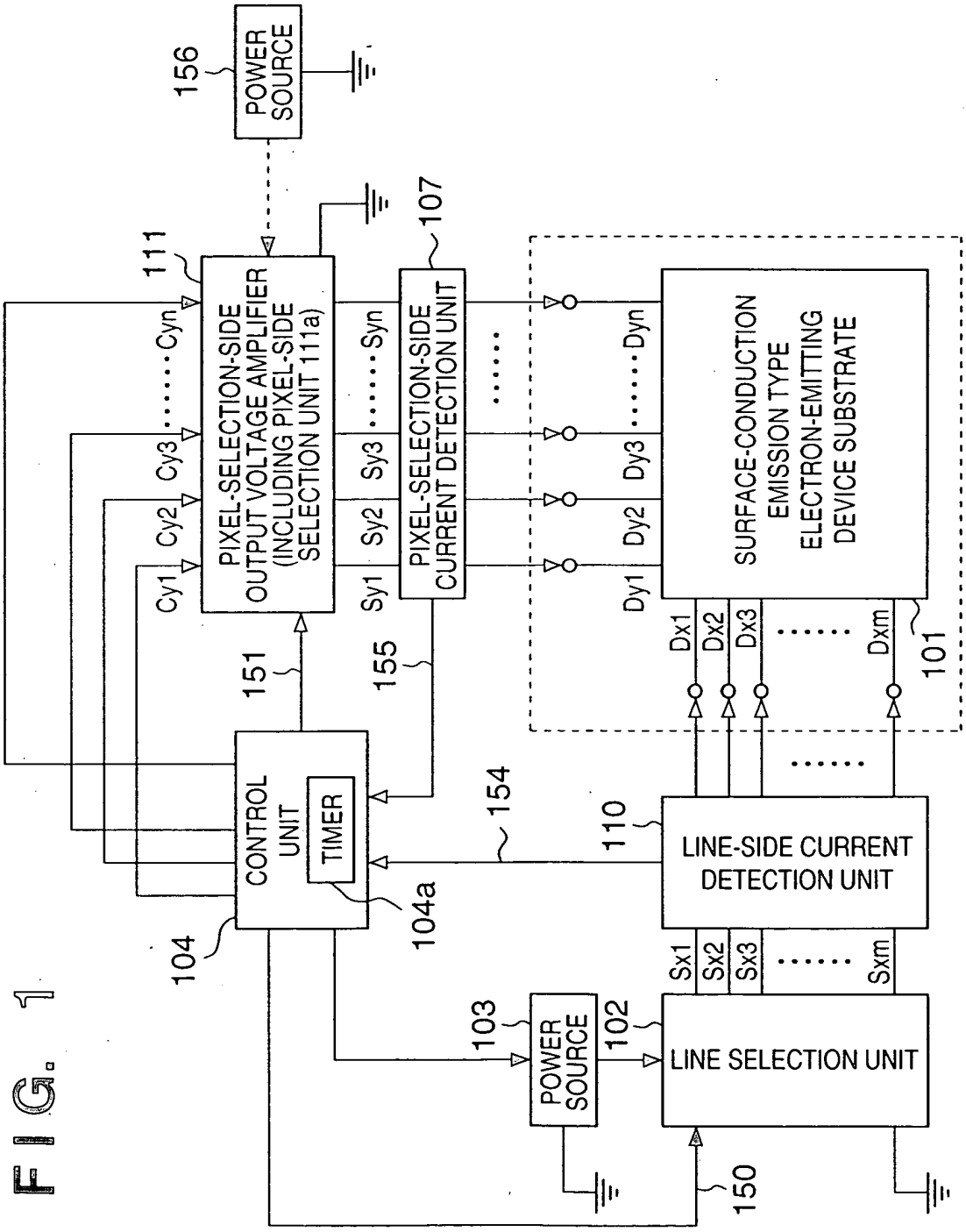

156
POWER SOURCE
111
PIXEL-SELECTION-SIDE OUTPUT VOLTAGE AMPLIFIER (INCLUDING PIXEL-SIDE SELECTION UNIT 111a)
107
PIXEL-SELECTION-SIDE CURRENT DETECTION UNIT
Cy1
Cy2
Cy3
Cyn
Sy1
Sy2
Sy3
Syn
Dy1
Dy2
Dy3
Dyn
SURFACE-CONDUCTION EMISSION TYPE ELECTRON-EMITTING DEVICE SUBSTRATE
Dx1
Dx2
Dx3
Dxm
101
151
155
CONTROL UNIT
TIMER
104
104a
154
110
LINE-SIDE CURRENT DETECTION UNIT
Sx1
Sx2
Sx3
Sxm
103
POWER SOURCE
102
LINE SELECTION UNIT
150

FIG. 1

FIG. 2

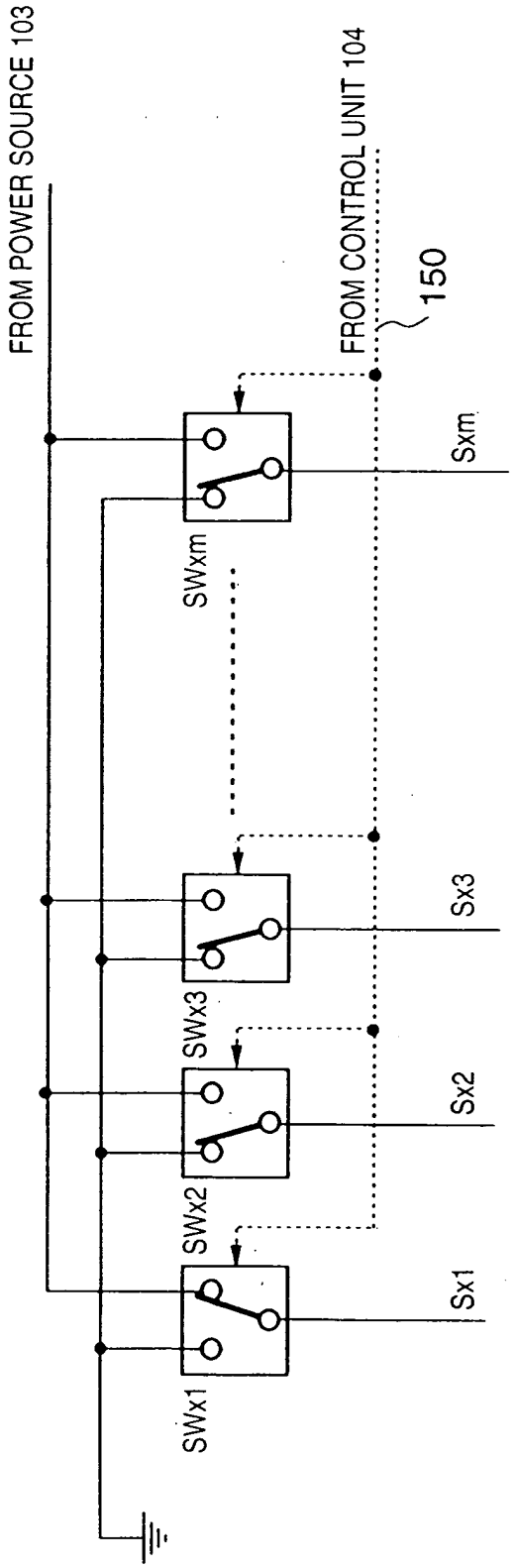

FROM POWER SOURCE 103
FROM CONTROL UNIT 104
150
Sxm
Sx3
Sx2
Sx1
SWxm
SWx3
SWx2
SWx1

FIG. 3

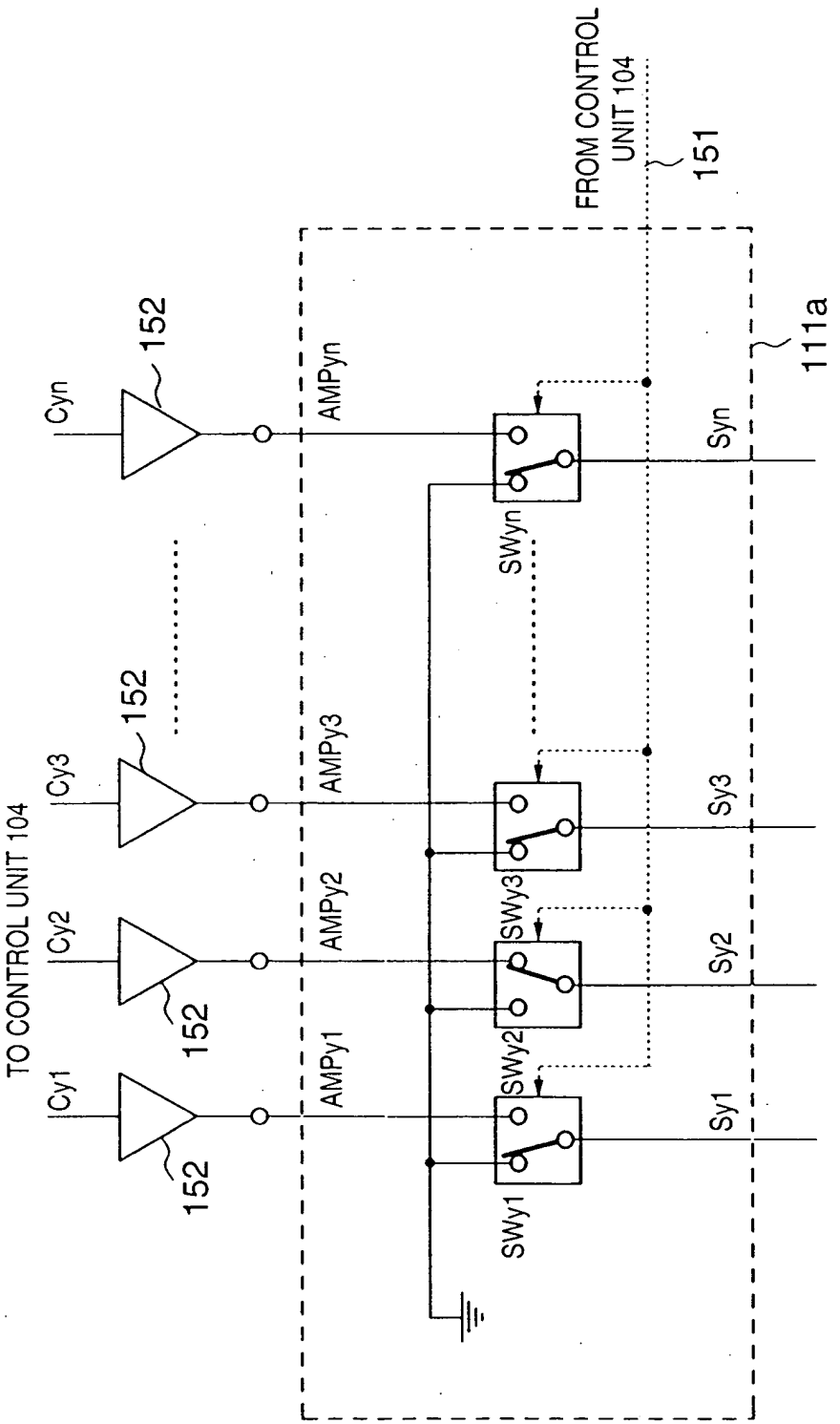

TO CONTROL UNIT 104
Cy1
Cy2
Cy3
Cyn
152
AMPy1
AMPy2
AMPy3
AMPyn
SWy1
SWy2
SWy3
SWyn
Sy1
Sy2
Sy3
Syn
FROM CONTROL UNIT 104
151
111a

FIG. 4A

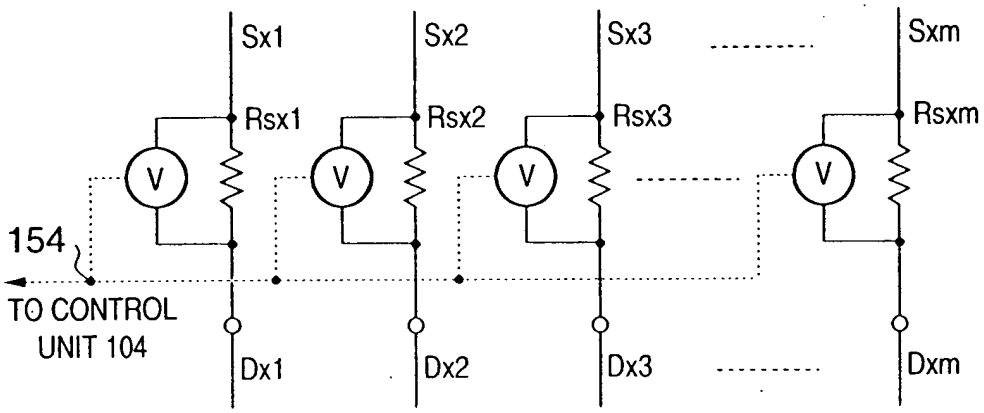

Sx1
Sx2
Sx3
Sxm
Rsx1
Rsx2
Rsx3
Rsxm
V
154
TO CONTROL
UNIT 104
Dx1
Dx2
Dx3
Dxm

FIG. 4B

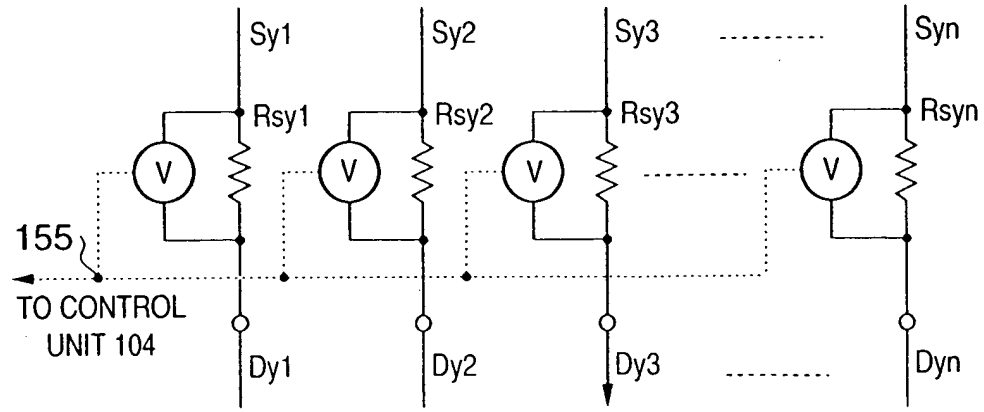

Sy1
Sy2
Sy3
Syn
Rsy1
Rsy2
Rsy3
Rsyn
V
155
TO CONTROL
UNIT 104
Dy1
Dy2
Dy3
Dyn

FIG. 5

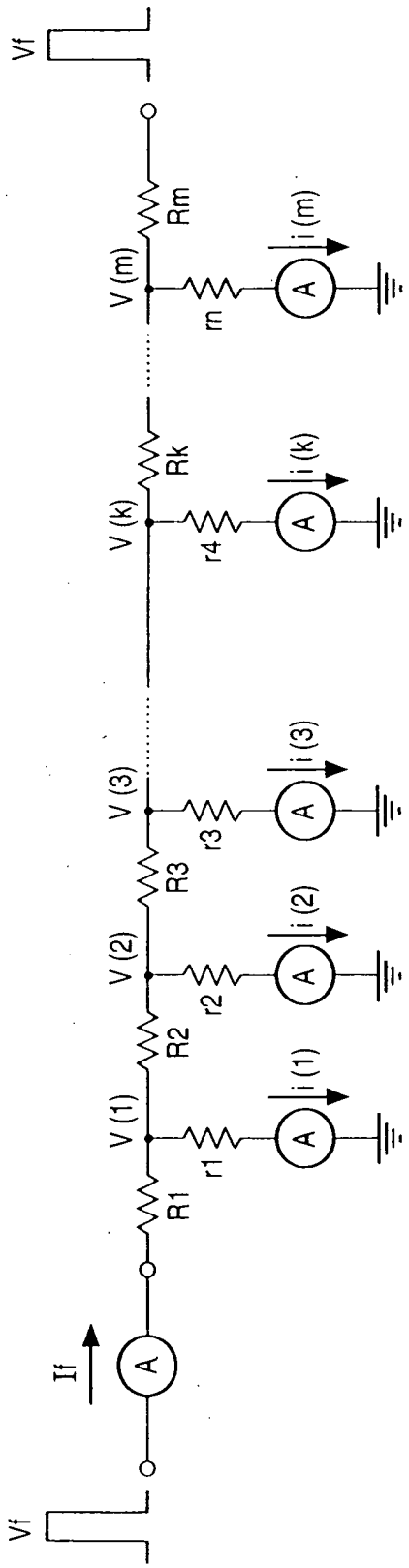


FIG. 6A

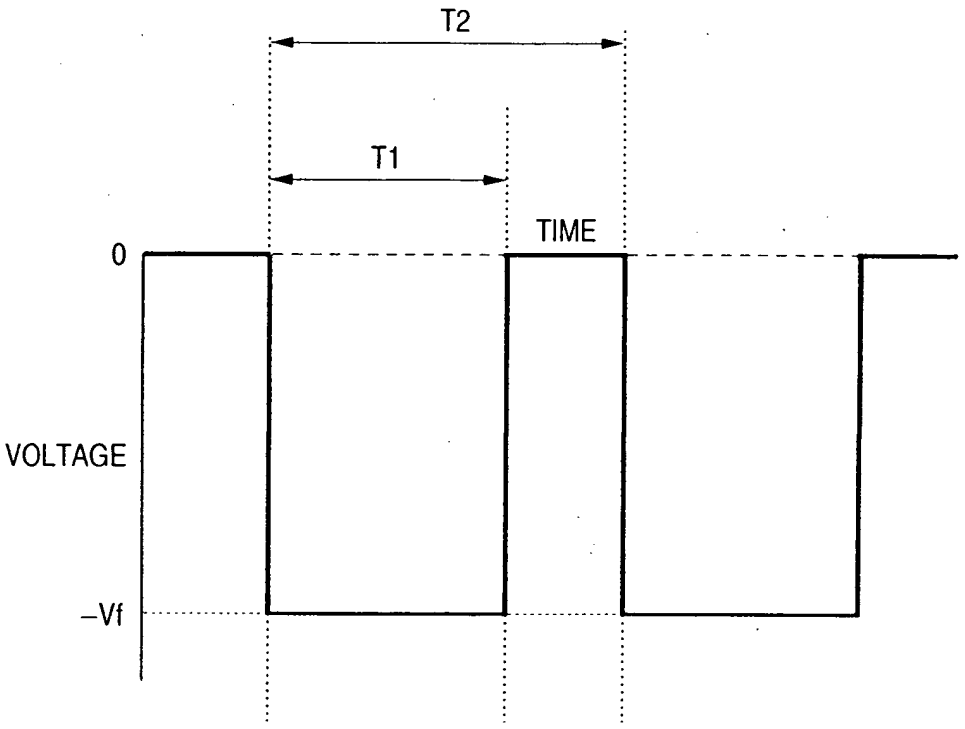



FIG. 6B

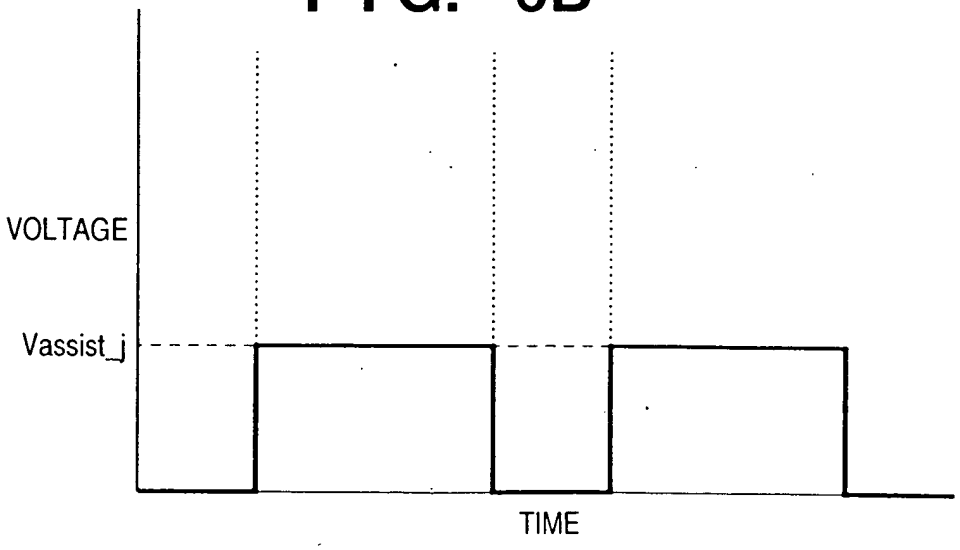


FIG. 7

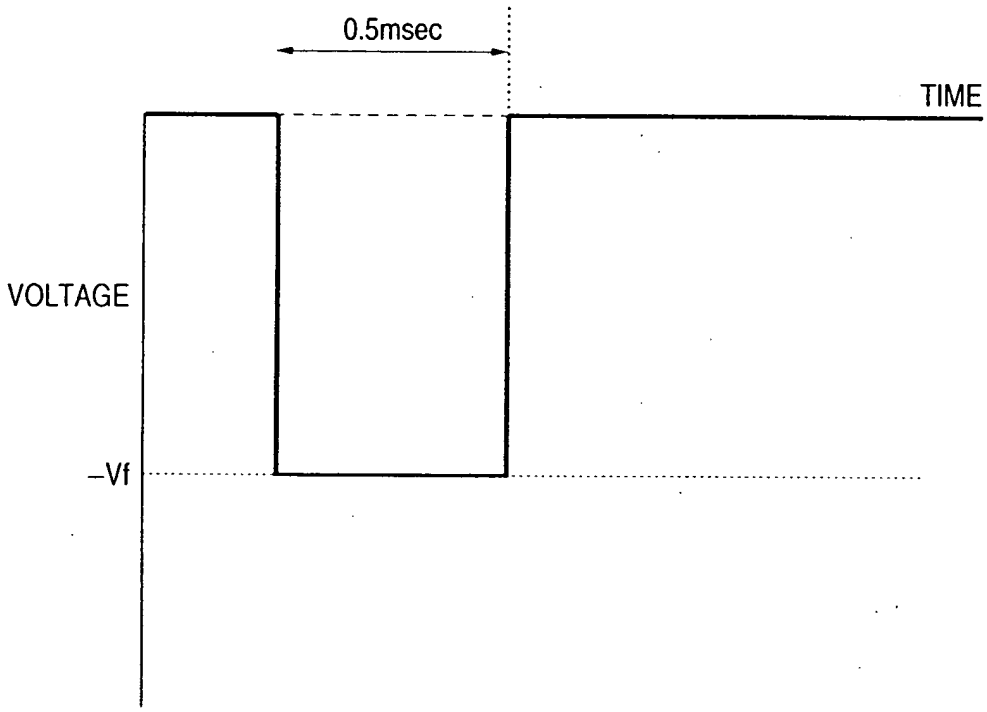
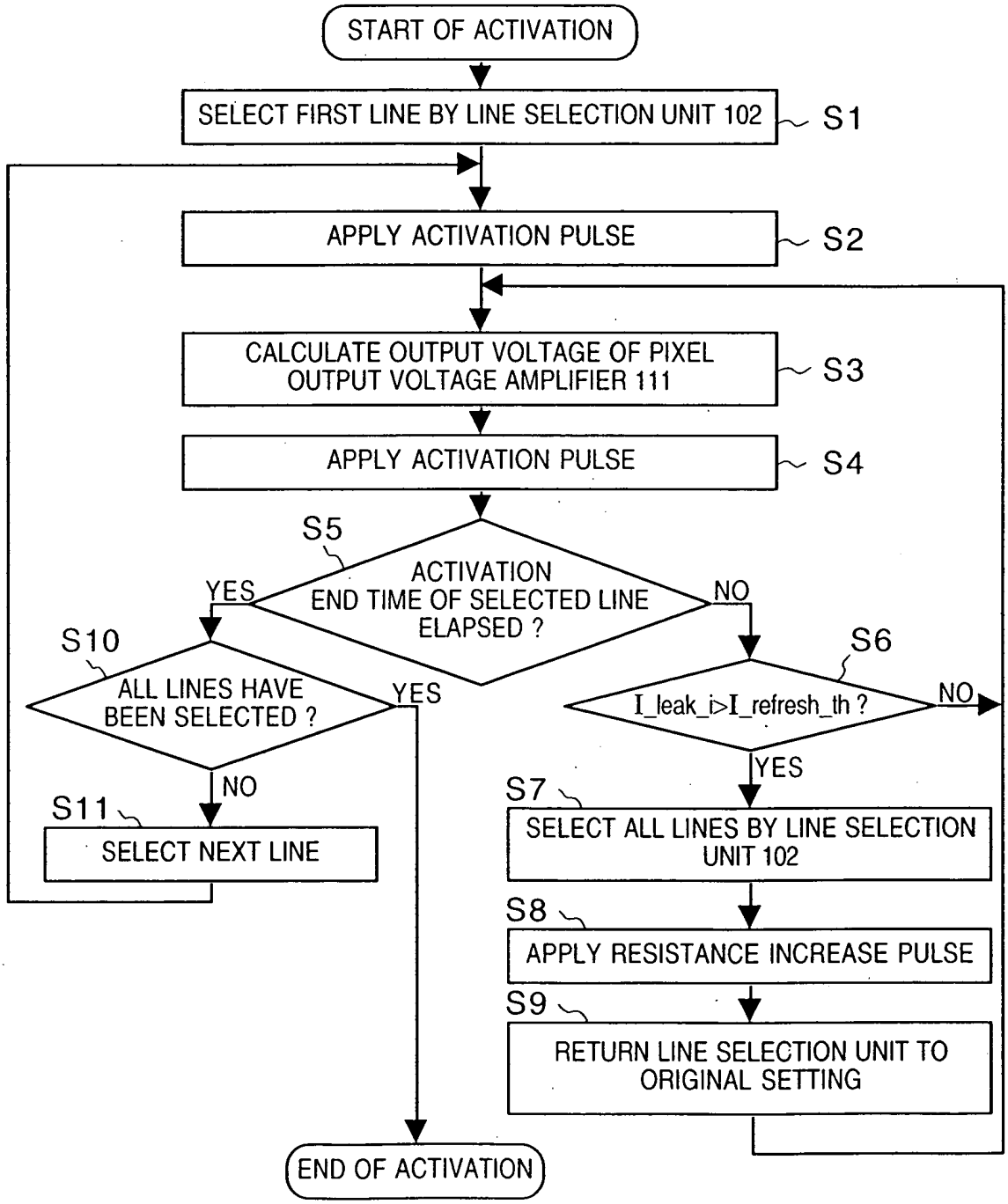


FIG. 8


START OF ACTIVATION
SELECT FIRST LINE BY LINE SELECTION UNIT 102
S1
APPLY ACTIVATION PULSE
S2
CALCULATE OUTPUT VOLTAGE OF PIXEL OUTPUT VOLTAGE AMPLIFIER 111
S3
APPLY ACTIVATION PULSE
S4
S5
ACTIVATION END TIME OF SELECTED LINE ELAPSED ?
YES
NO
S10
ALL LINES HAVE BEEN SELECTED ?
YES
NO
S11
SELECT NEXT LINE
S6
I_leak_i>I_refresh_th ?
NO
YES
S7
SELECT ALL LINES BY LINE SELECTION UNIT 102
S8
APPLY RESISTANCE INCREASE PULSE
S9
RETURN LINE SELECTION UNIT TO ORIGINAL SETTING
END OF ACTIVATION

# FIG. 9

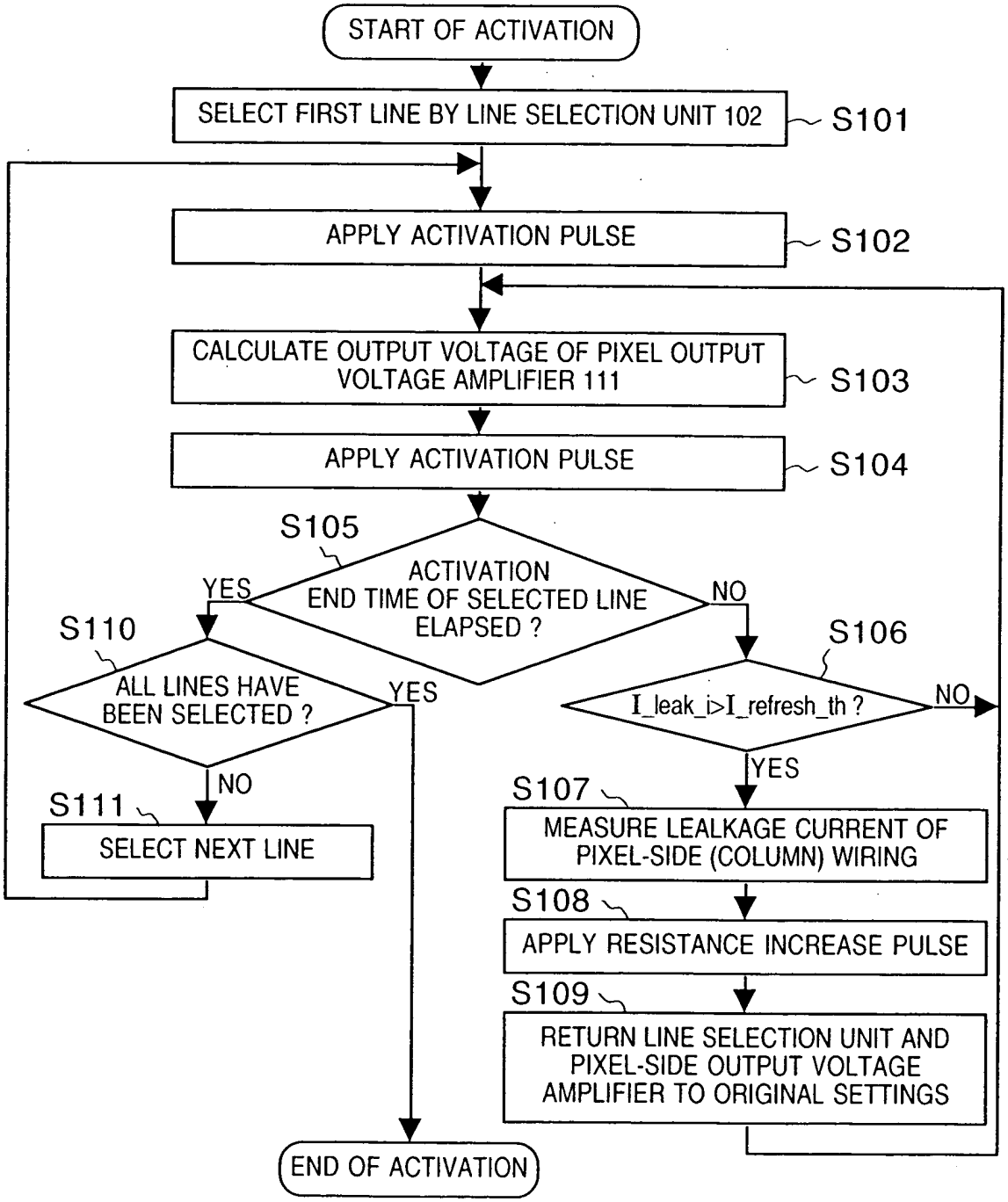

START OF ACTIVATION
SELECT FIRST LINE BY LINE SELECTION UNIT 102
S101
APPLY ACTIVATION PULSE
S102
CALCULATE OUTPUT VOLTAGE OF PIXEL OUTPUT VOLTAGE AMPLIFIER 111
S103
APPLY ACTIVATION PULSE
S104
S105
ACTIVATION END TIME OF SELECTED LINE ELAPSED ?
YES
NO
S110
ALL LINES HAVE BEEN SELECTED ?
YES
NO
S111
SELECT NEXT LINE
S106
I_leak_i>I_refresh_th ?
NO
YES
S107
MEASURE LEALKAGE CURRENT OF PIXEL-SIDE (COLUMN) WIRING
S108
APPLY RESISTANCE INCREASE PULSE
S109
RETURN LINE SELECTION UNIT AND PIXEL-SIDE OUTPUT VOLTAGE AMPLIFIER TO ORIGINAL SETTINGS
END OF ACTIVATION

FIG. 10

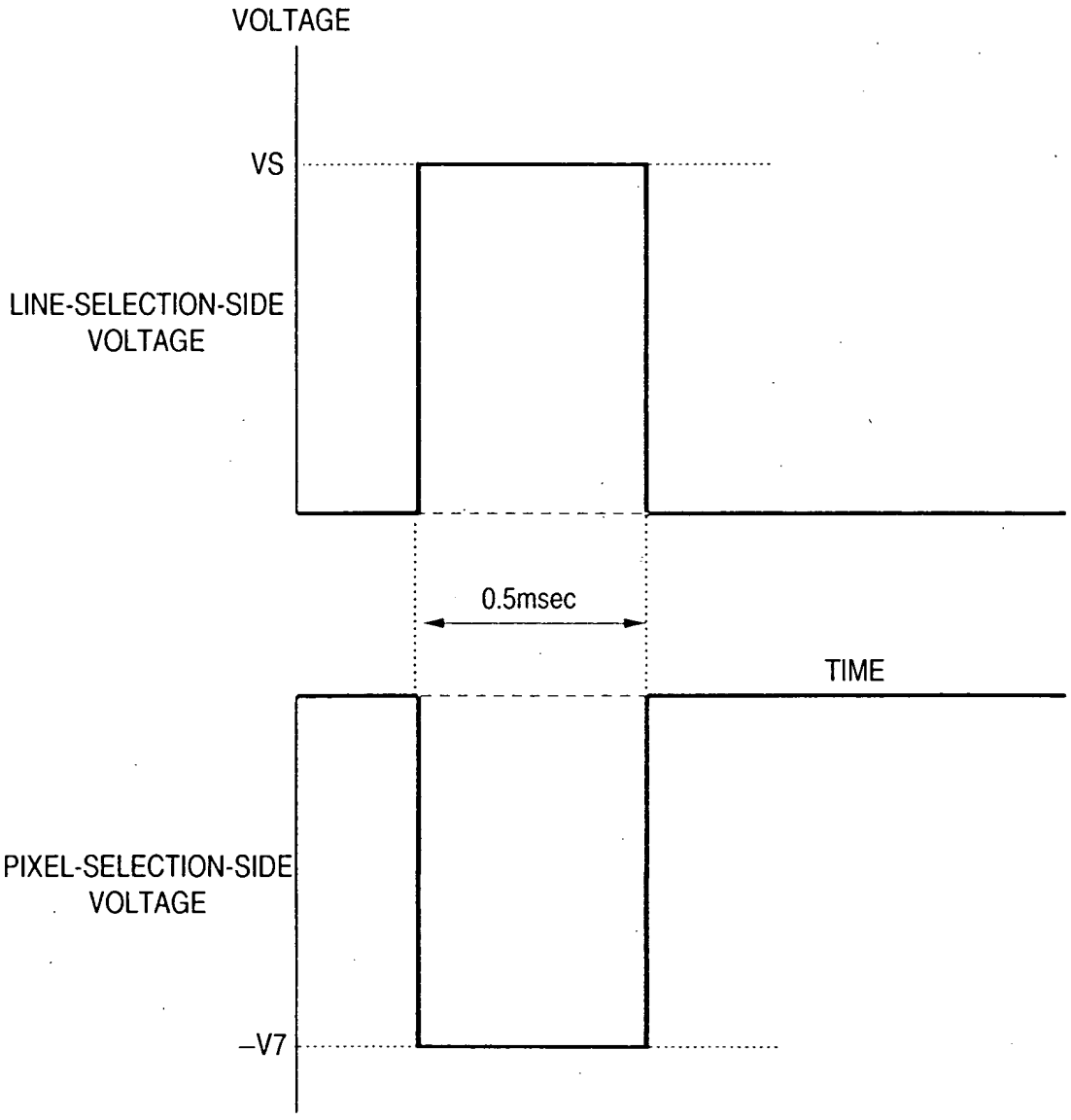

VOLTAGE
VS
LINE-SELECTION-SIDE VOLTAGE
0.5msec
TIME
PIXEL-SELECTION-SIDE VOLTAGE
–V7

FIG. 11

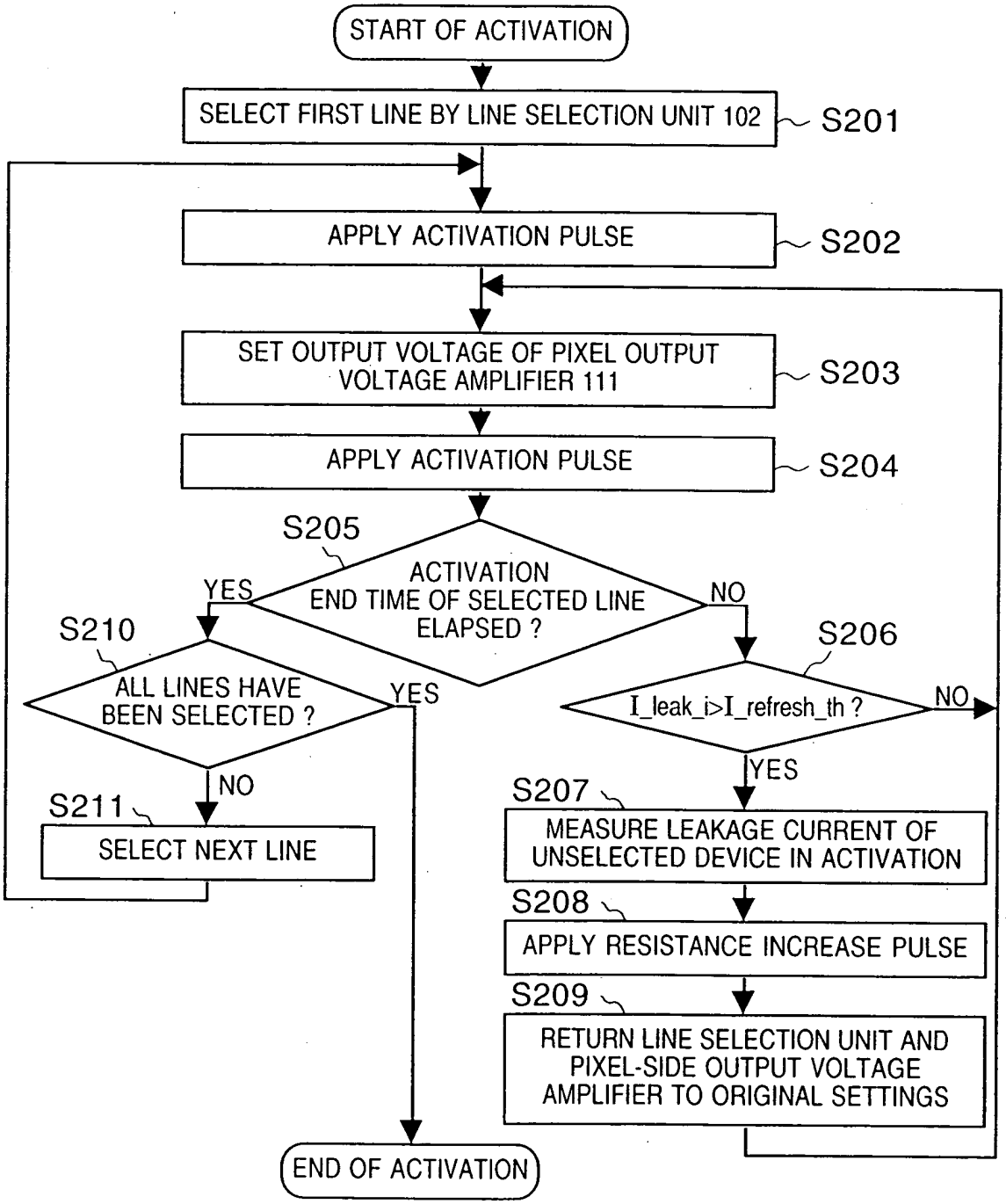

START OF ACTIVATION
SELECT FIRST LINE BY LINE SELECTION UNIT 102
S201
APPLY ACTIVATION PULSE
S202
SET OUTPUT VOLTAGE OF PIXEL OUTPUT VOLTAGE AMPLIFIER 111
S203
APPLY ACTIVATION PULSE
S204
S205
ACTIVATION END TIME OF SELECTED LINE ELAPSED ?
YES
NO
S210
ALL LINES HAVE BEEN SELECTED ?
YES
NO
S211
SELECT NEXT LINE
S206
I_leak_i>I_refresh_th ?
NO
YES
S207
MEASURE LEAKAGE CURRENT OF UNSELECTED DEVICE IN ACTIVATION
S208
APPLY RESISTANCE INCREASE PULSE
S209
RETURN LINE SELECTION UNIT AND PIXEL-SIDE OUTPUT VOLTAGE AMPLIFIER TO ORIGINAL SETTINGS
END OF ACTIVATION

FIG. 12

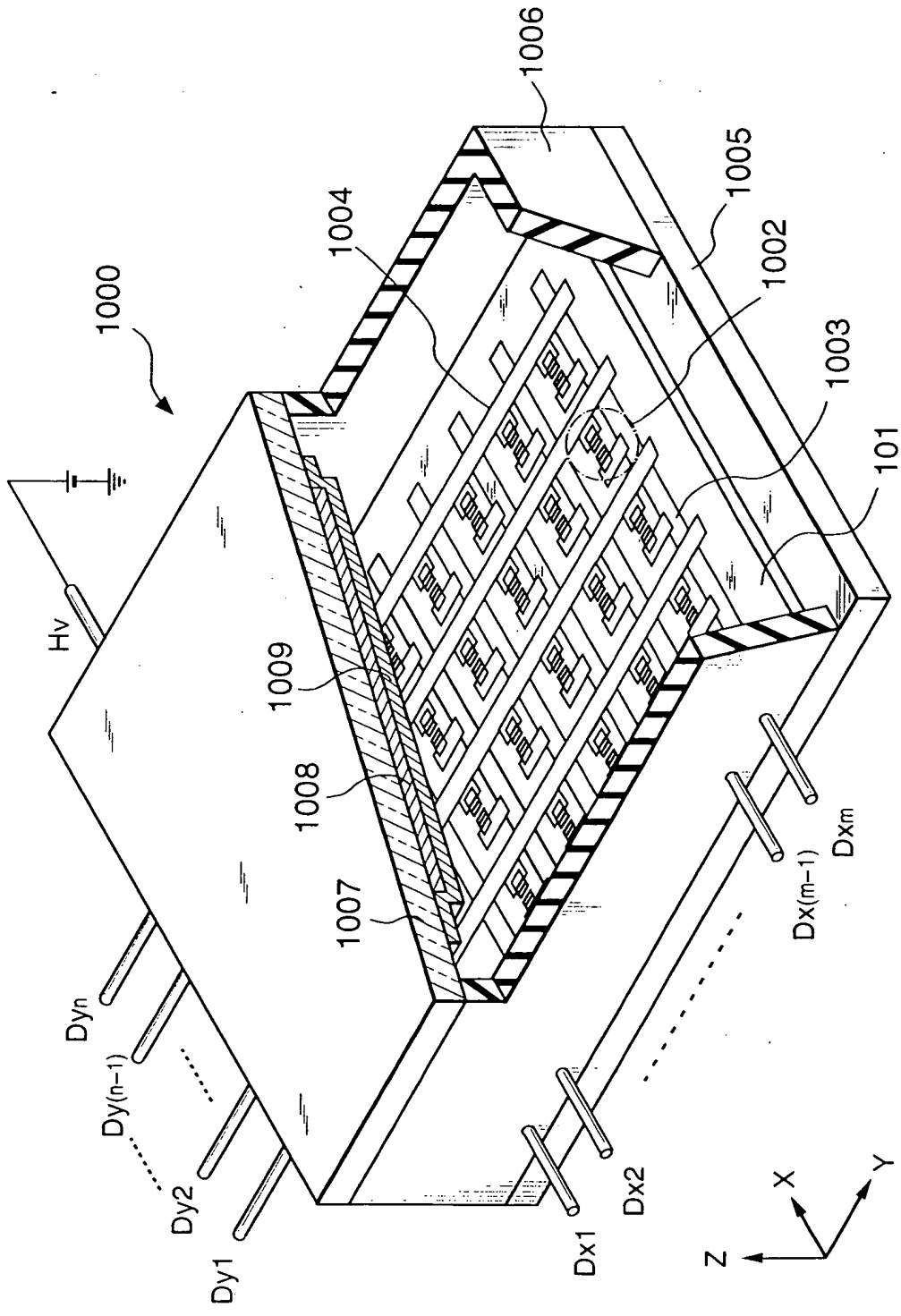

1000
1006
1004
1005
1002
1003
101
1009
1008
1007
Hv
Dyn
Dy(n-1)
Dy2
Dy1
Dx1
Dx2
Dx(m-1)
Dxm
X
Y
Z

FIG. 13A

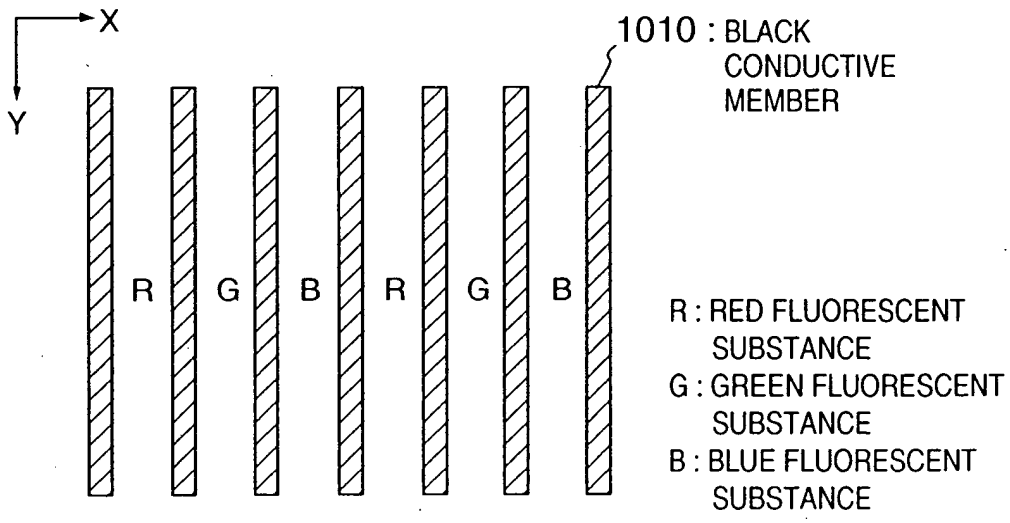



FIG. 13B

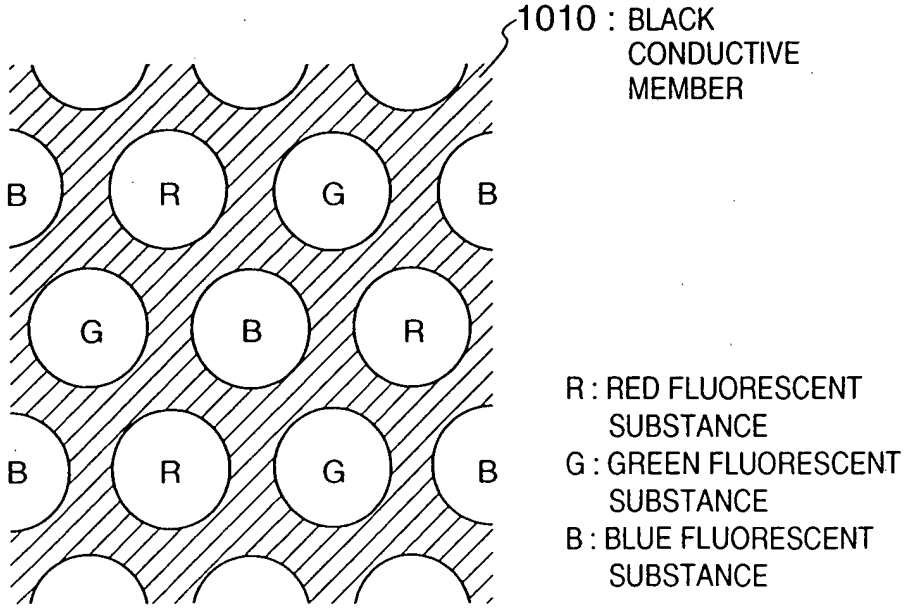


FIG. 14A

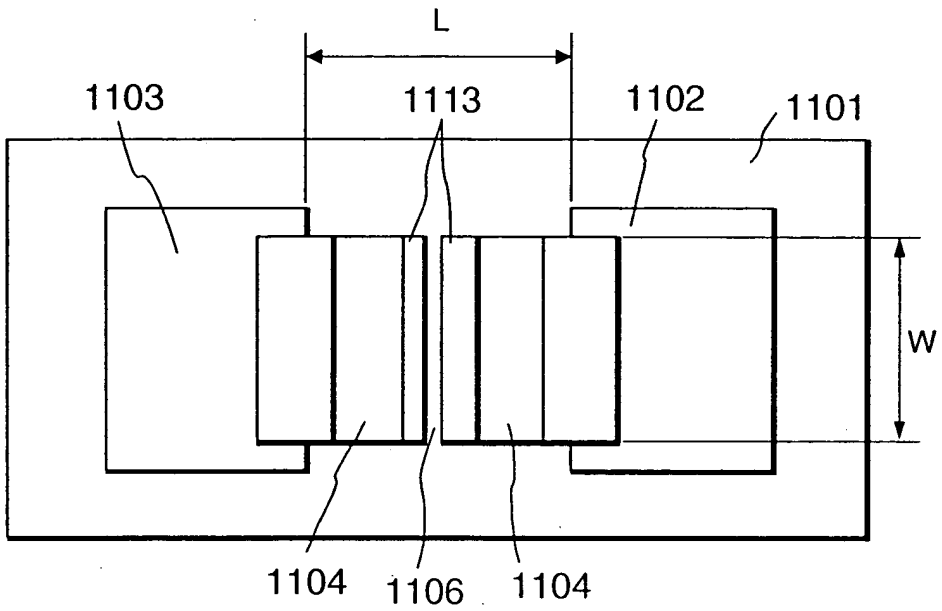



FIG. 14B

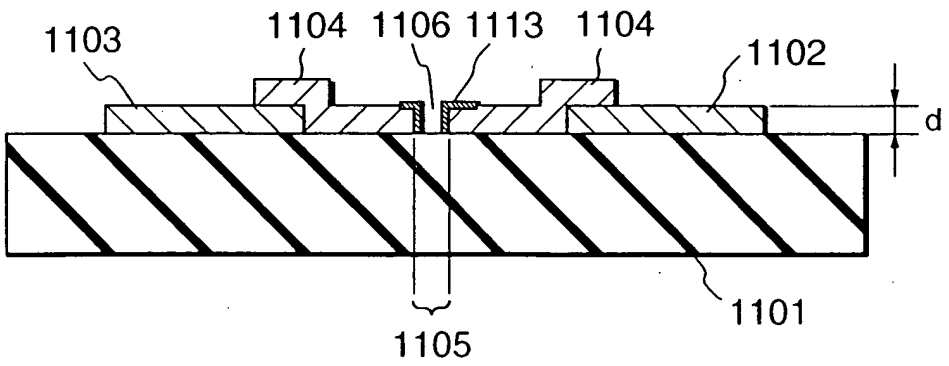


FIG. 15A

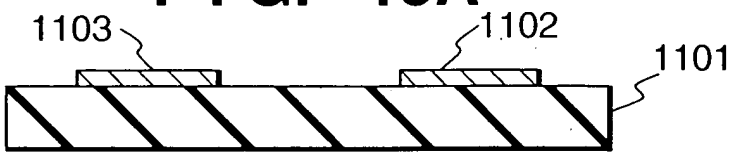



FIG. 15B

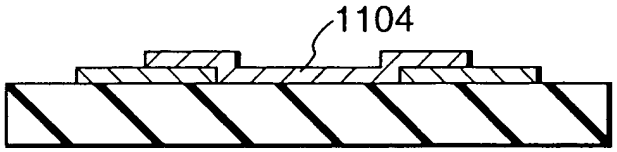



FIG. 15C

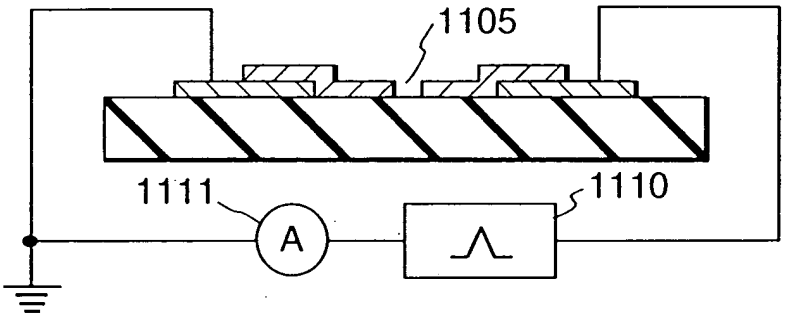



FIG. 15D

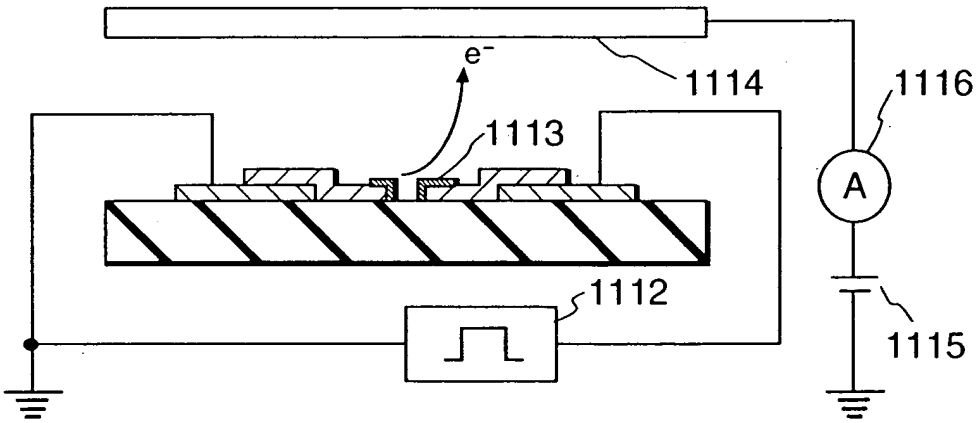



FIG. 15E

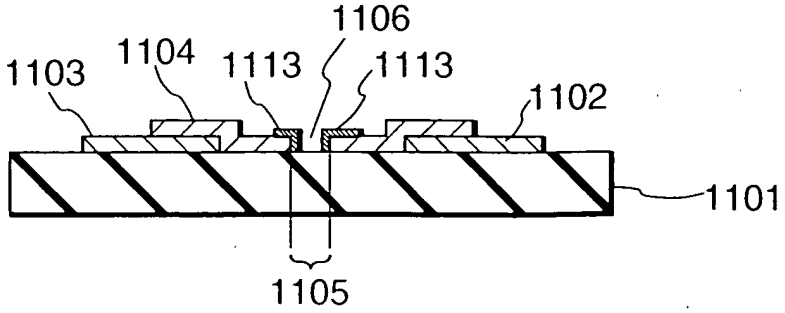


FIG. 16

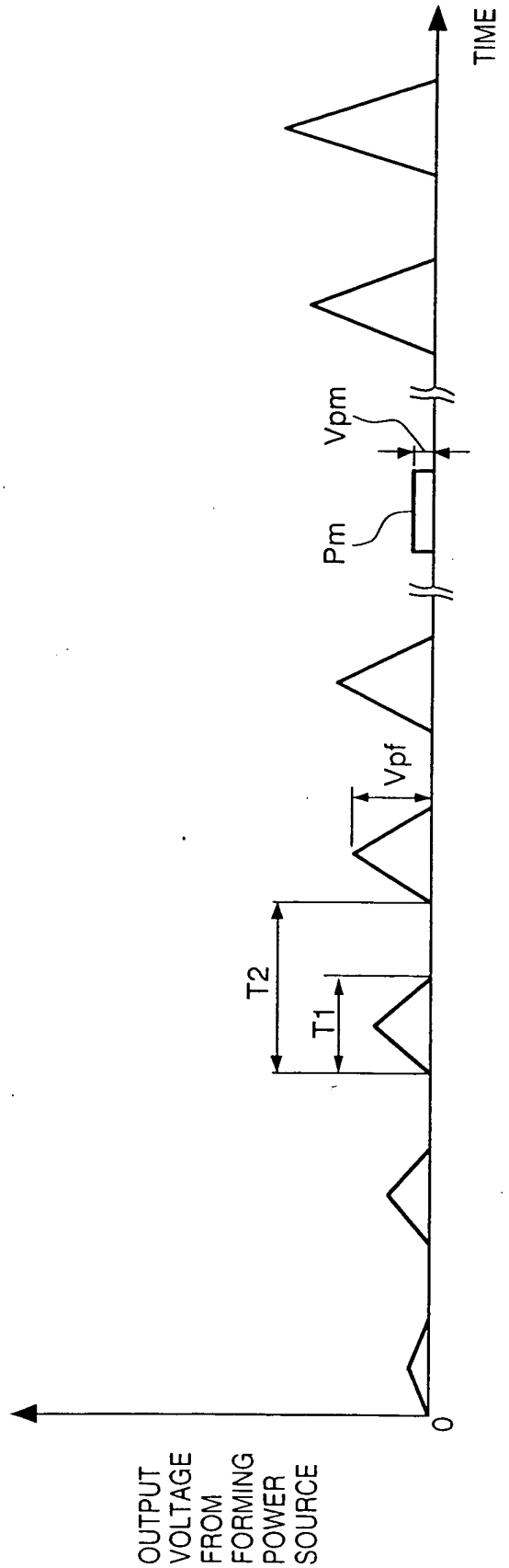

OUTPUT VOLTAGE FROM FORMING POWER SOURCE
0
TIME
T1
T2
Vpf
Pm
Vpm

FIG. 17A

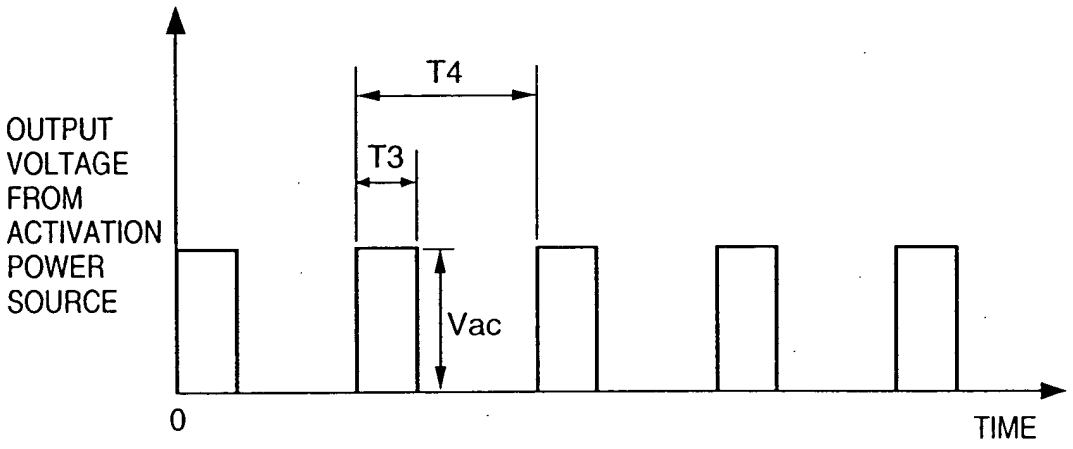



FIG. 17B

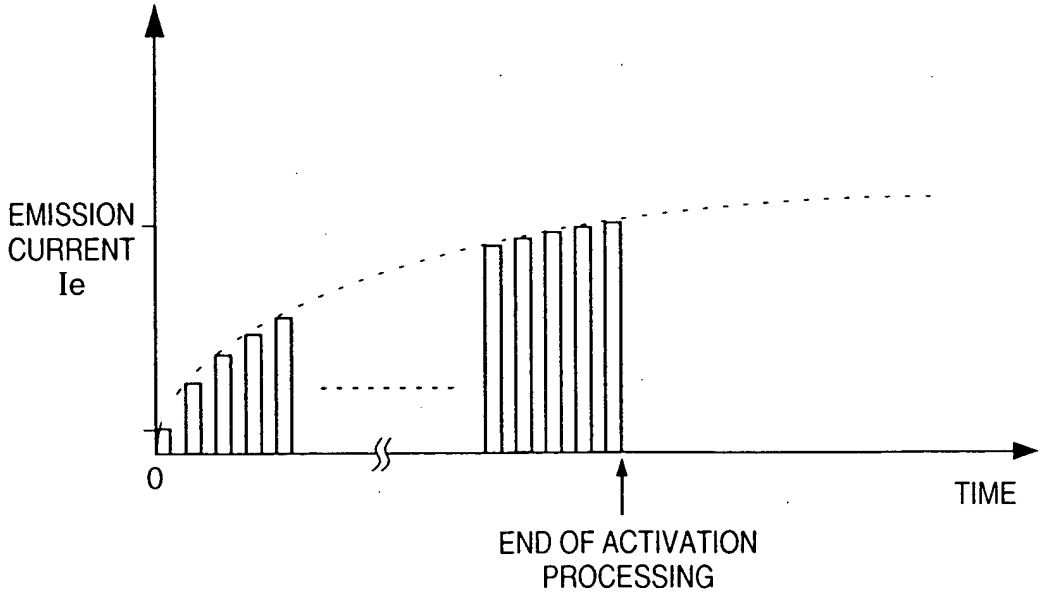


FIG. 18

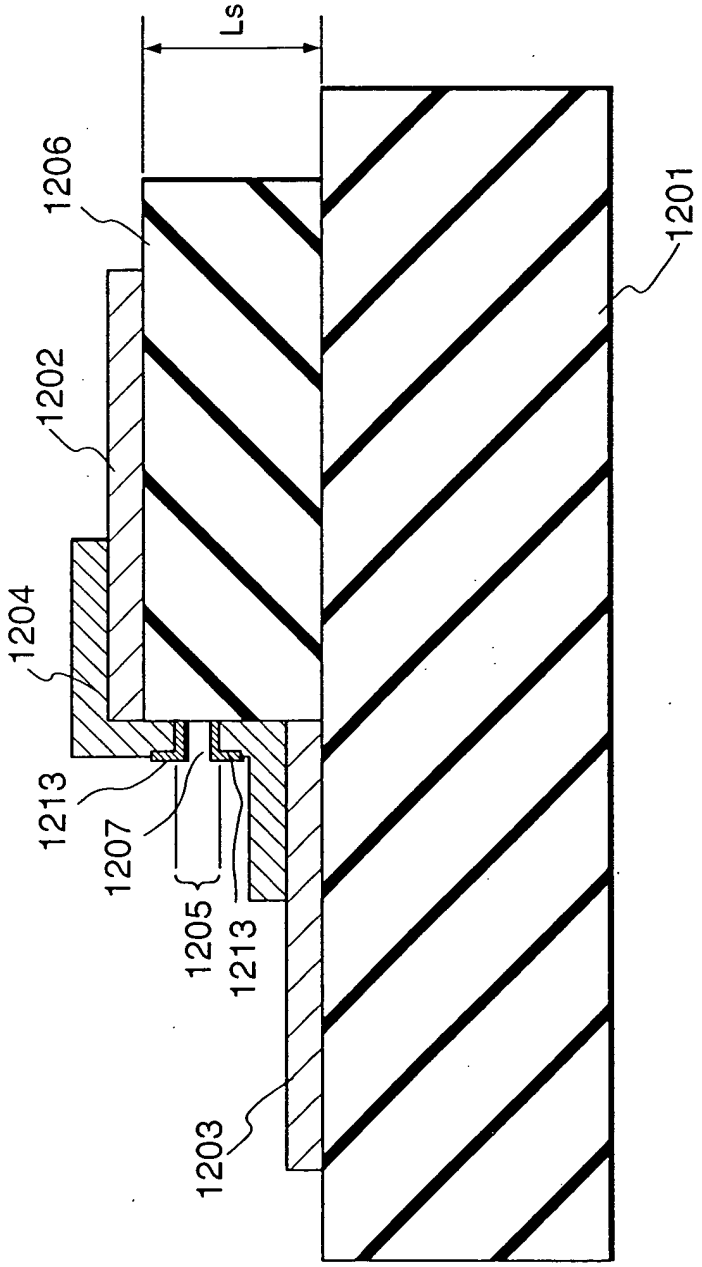


FIG. 19A

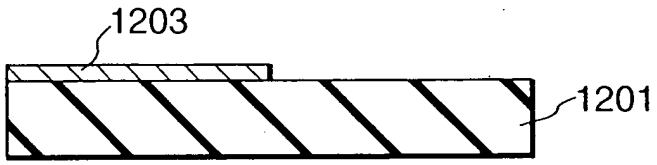



FIG. 19B

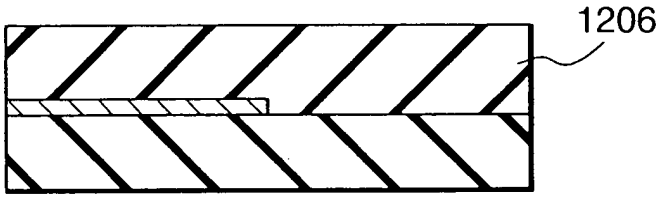



FIG. 19C

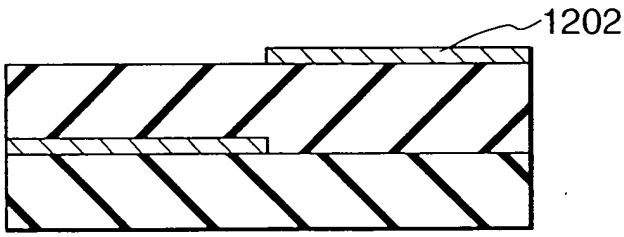



FIG. 19D

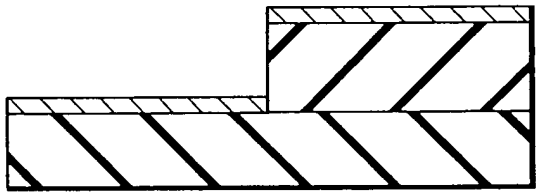


FIG. 19E

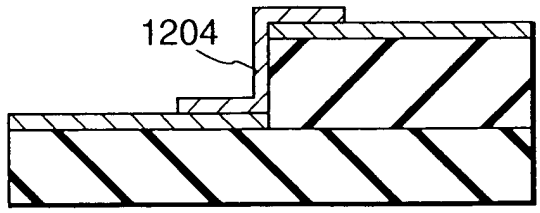



FIG. 19F

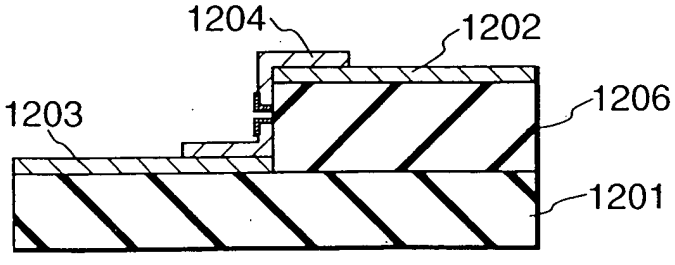


FIG. 20

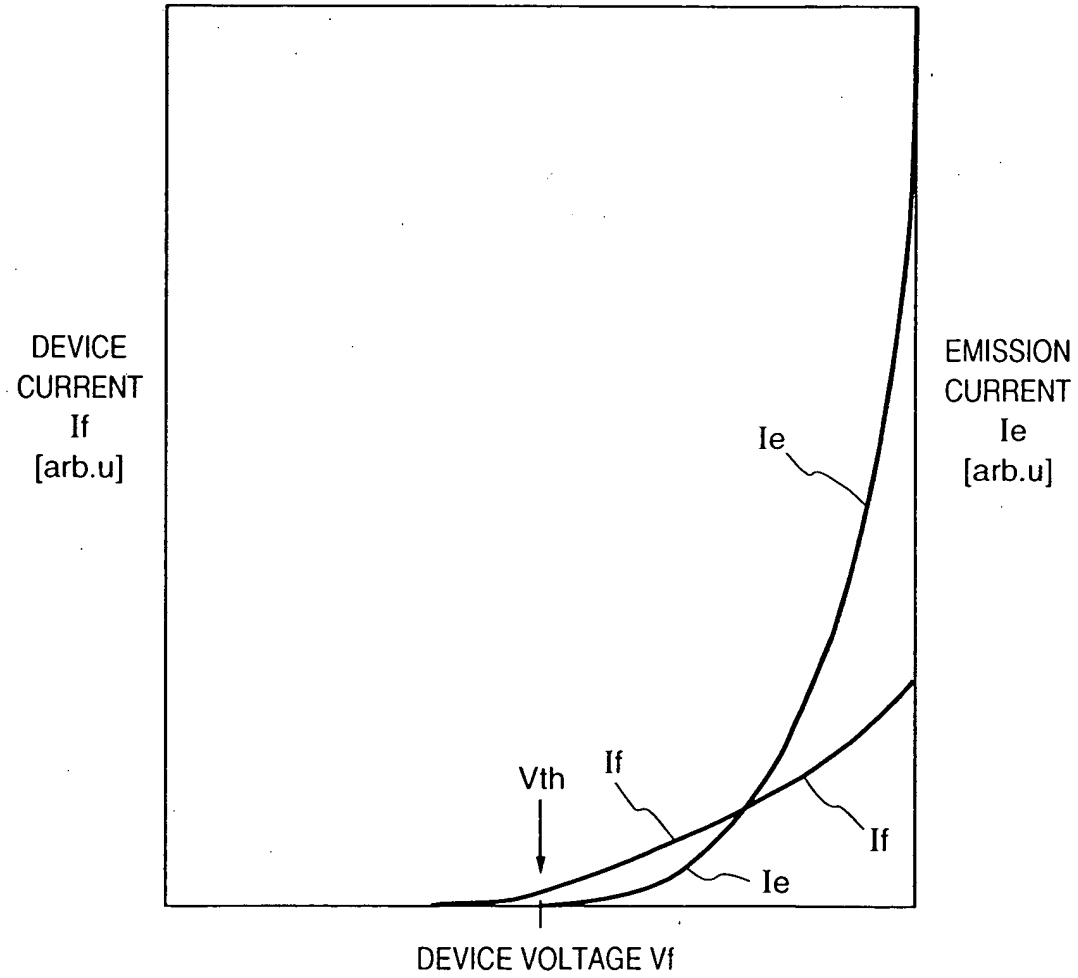

DEVICE
CURRENT
If
[arb.u]
EMISSION
CURRENT
Ie
[arb.u]
Ie
Vth
If
If
Ie
DEVICE VOLTAGE Vf

FIG. 21

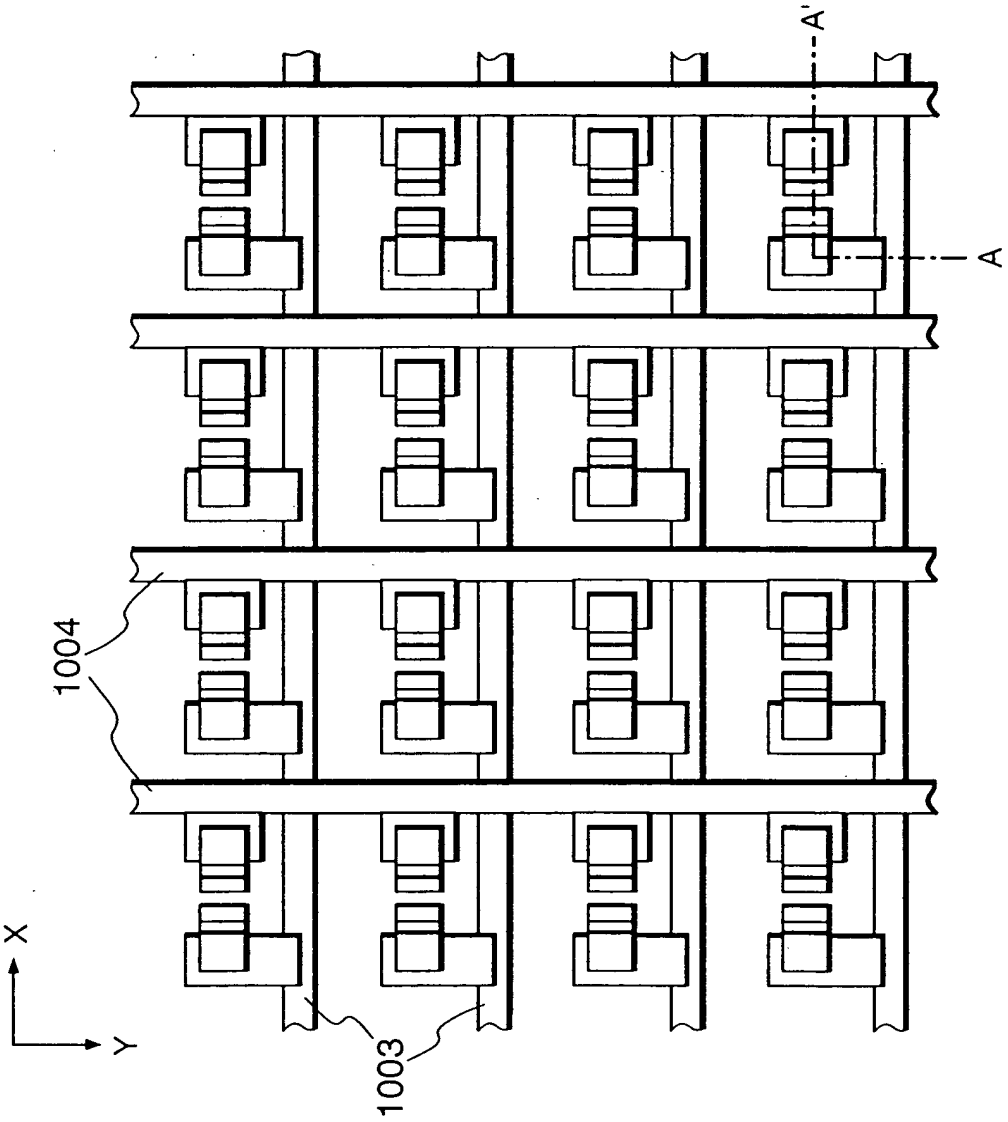


FIG. 22

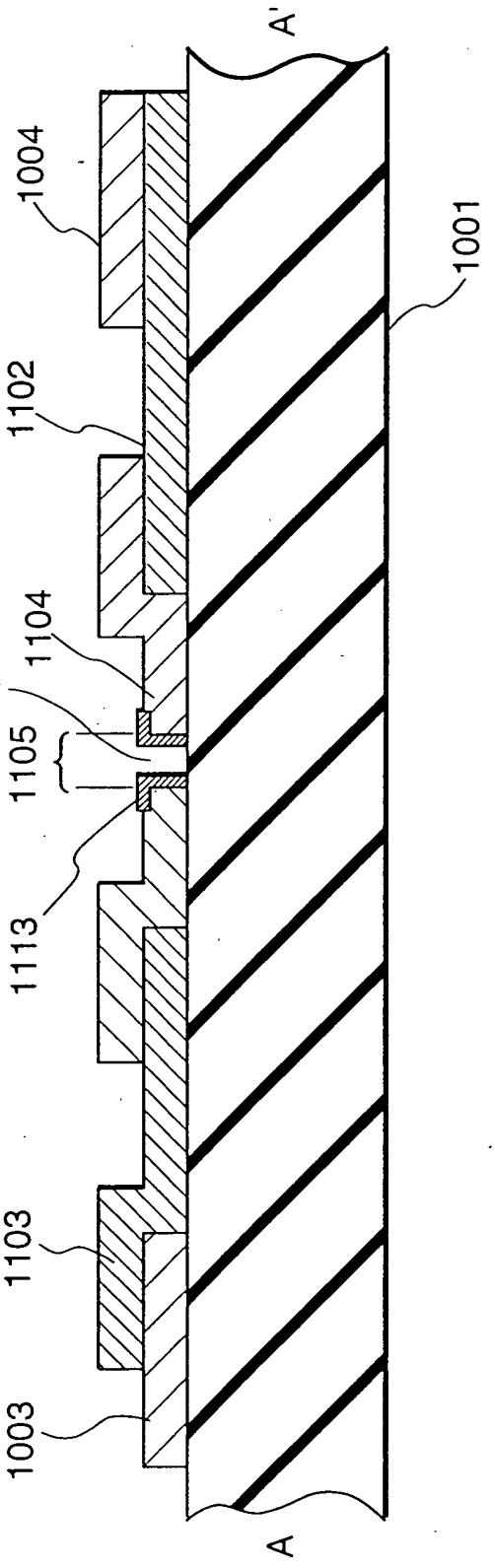


FIG. 23

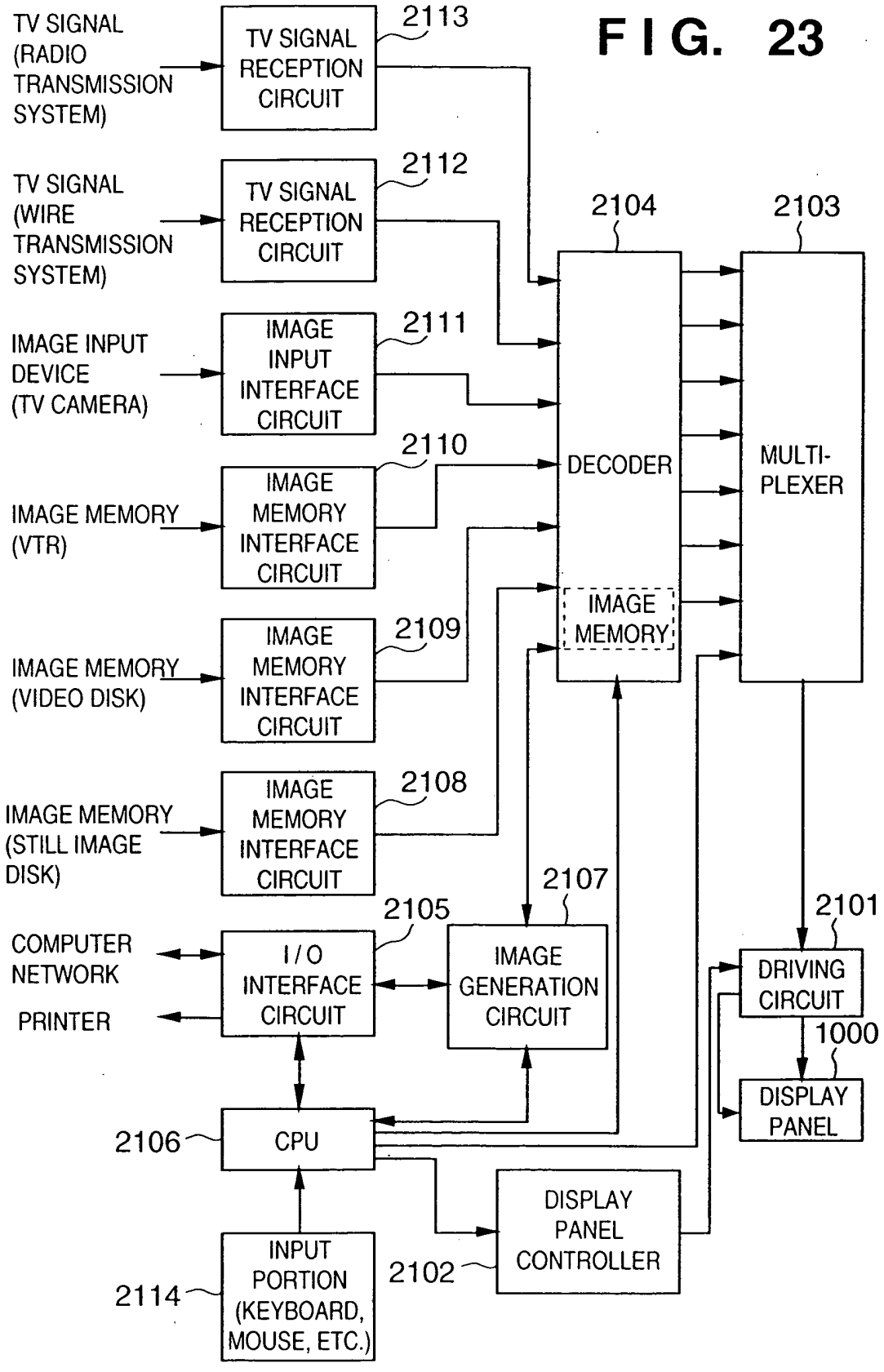

TV SIGNAL (RADIO TRANSMISSION SYSTEM)
TV SIGNAL RECEPTION CIRCUIT
2113
TV SIGNAL (WIRE TRANSMISSION SYSTEM)
TV SIGNAL RECEPTION CIRCUIT
2112
IMAGE INPUT DEVICE (TV CAMERA)
IMAGE INPUT INTERFACE CIRCUIT
2111
IMAGE MEMORY (VTR)
IMAGE MEMORY INTERFACE CIRCUIT
2110
IMAGE MEMORY (VIDEO DISK)
IMAGE MEMORY INTERFACE CIRCUIT
2109
IMAGE MEMORY (STILL IMAGE DISK)
IMAGE MEMORY INTERFACE CIRCUIT
2108
2104
DECODER
IMAGE MEMORY
2103
MULTI-PLEXER
2107
2101
COMPUTER NETWORK
PRINTER
I/O INTERFACE CIRCUIT
2105
IMAGE GENERATION CIRCUIT
DRIVING CIRCUIT
1000
DISPLAY PANEL
2106
CPU
DISPLAY PANEL CONTROLLER
2102
2114
INPUT PORTION (KEYBOARD, MOUSE, ETC.)

FIG. 24

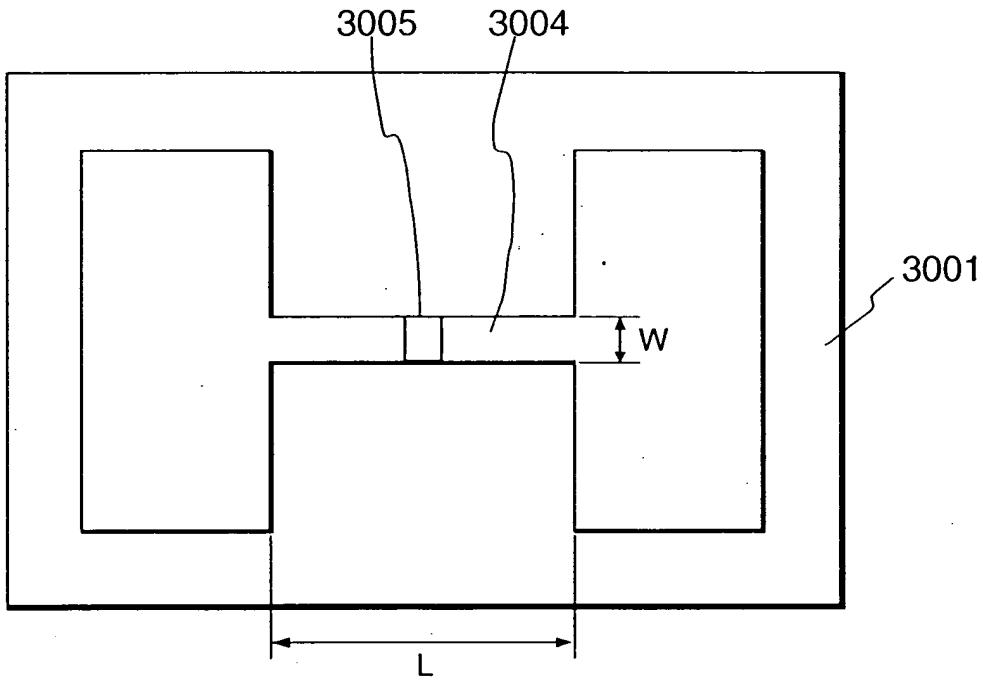


FIG. 25

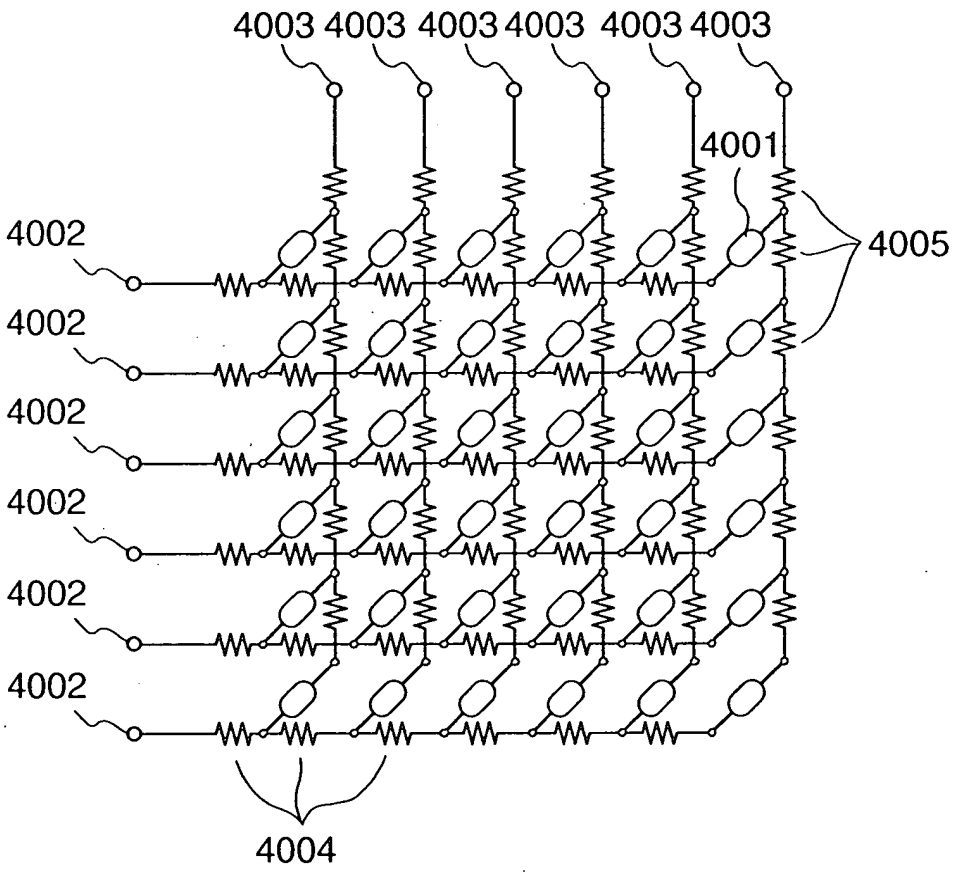

4003 4003 4003 4003 4003 4003
4001
4005
4002
4002
4002
4002
4002
4002
4004

FIG. 26

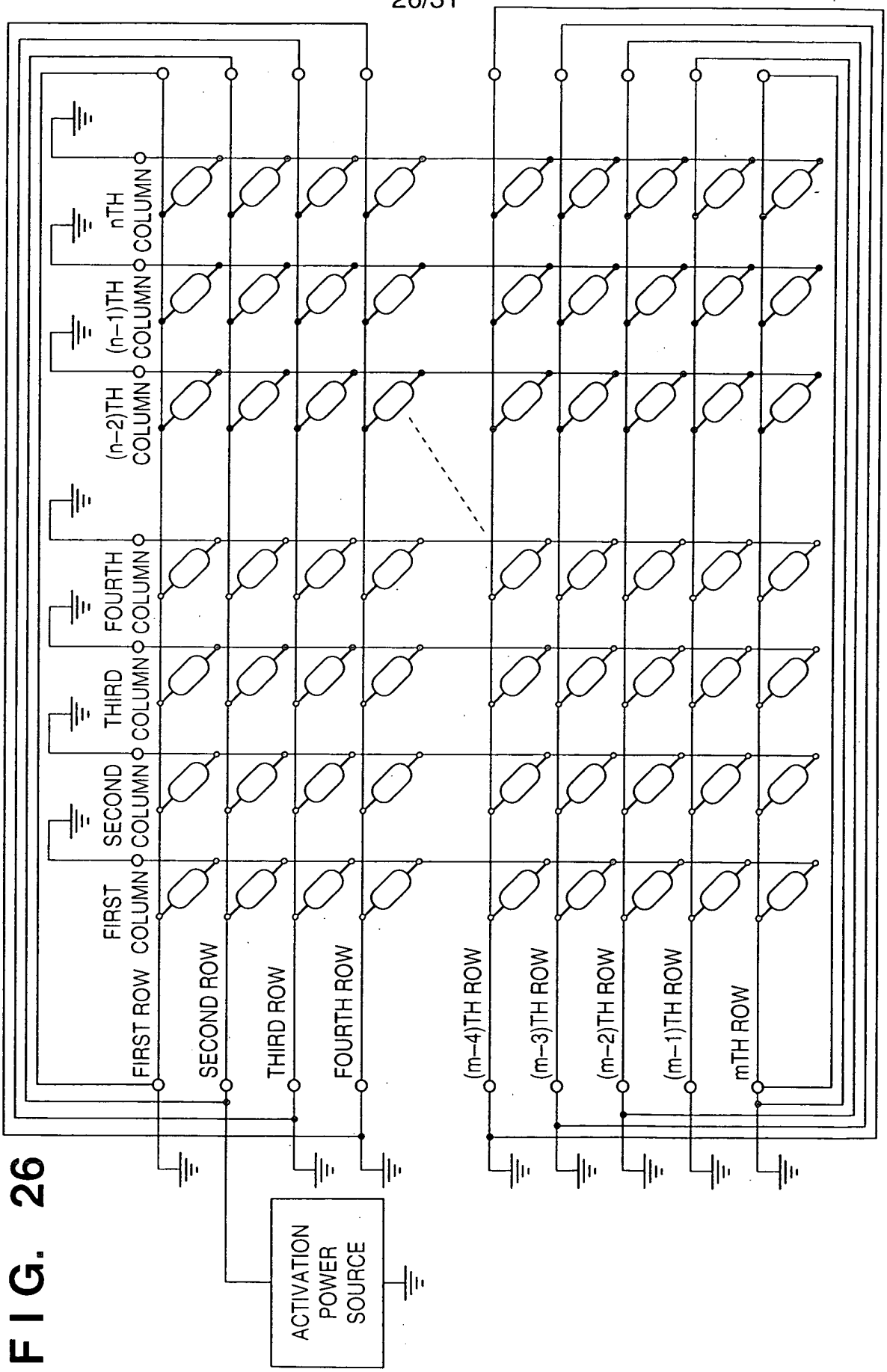

FIRST COLUMN
SECOND COLUMN
THIRD COLUMN
FOURTH COLUMN
(n−2)TH COLUMN
(n−1)TH COLUMN
nTH COLUMN
FIRST ROW
SECOND ROW
THIRD ROW
FOURTH ROW
(m−4)TH ROW
(m−3)TH ROW
(m−2)TH ROW
(m−1)TH ROW
mTH ROW
ACTIVATION POWER SOURCE

FIG. 27

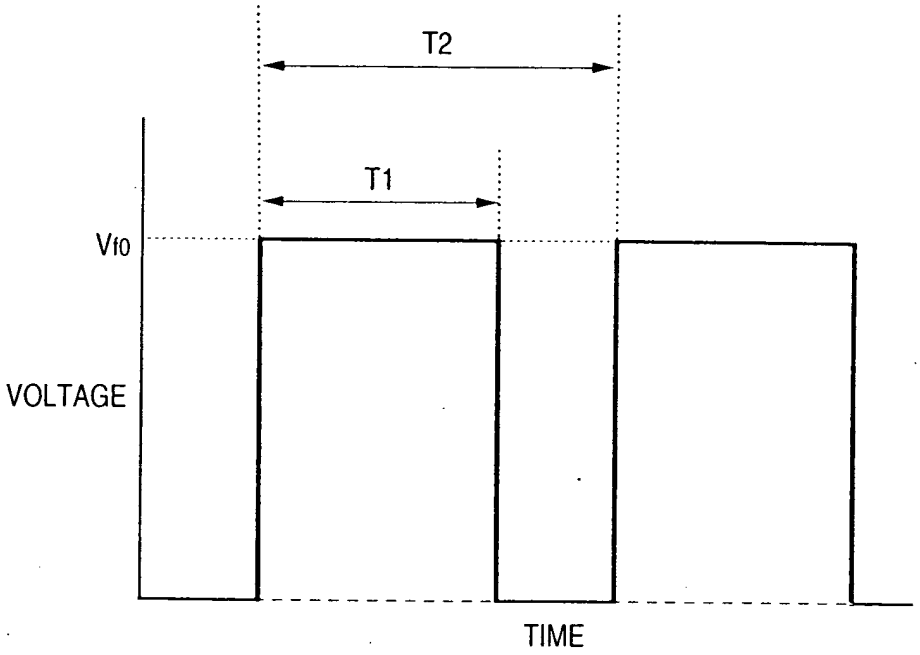


FIG. 28

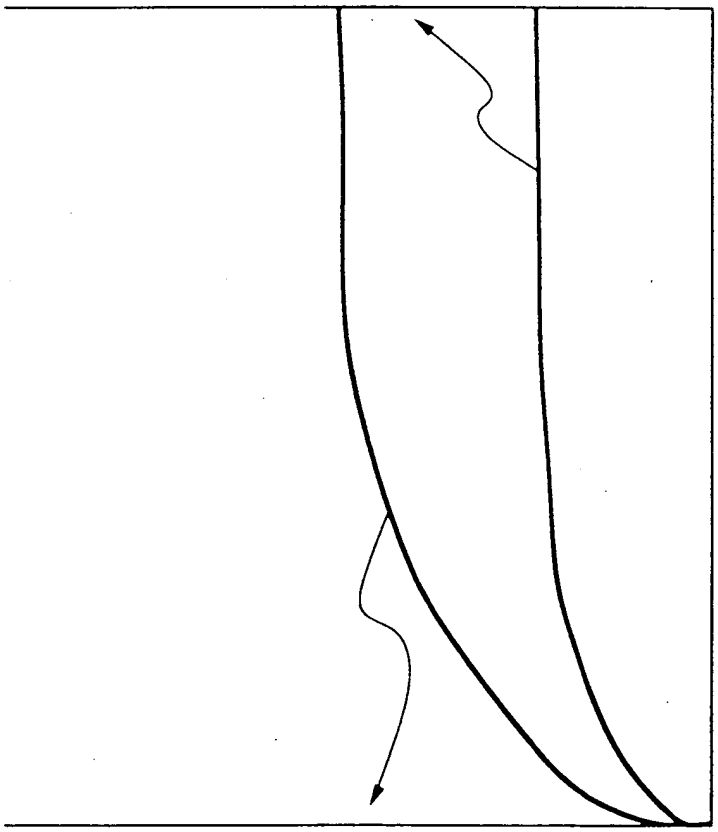

EMISSION CURRENT Ie (μA)
DEVICE CURRENT If (mA)
ACTIVATION TIME (MIN)

FIG. 29A

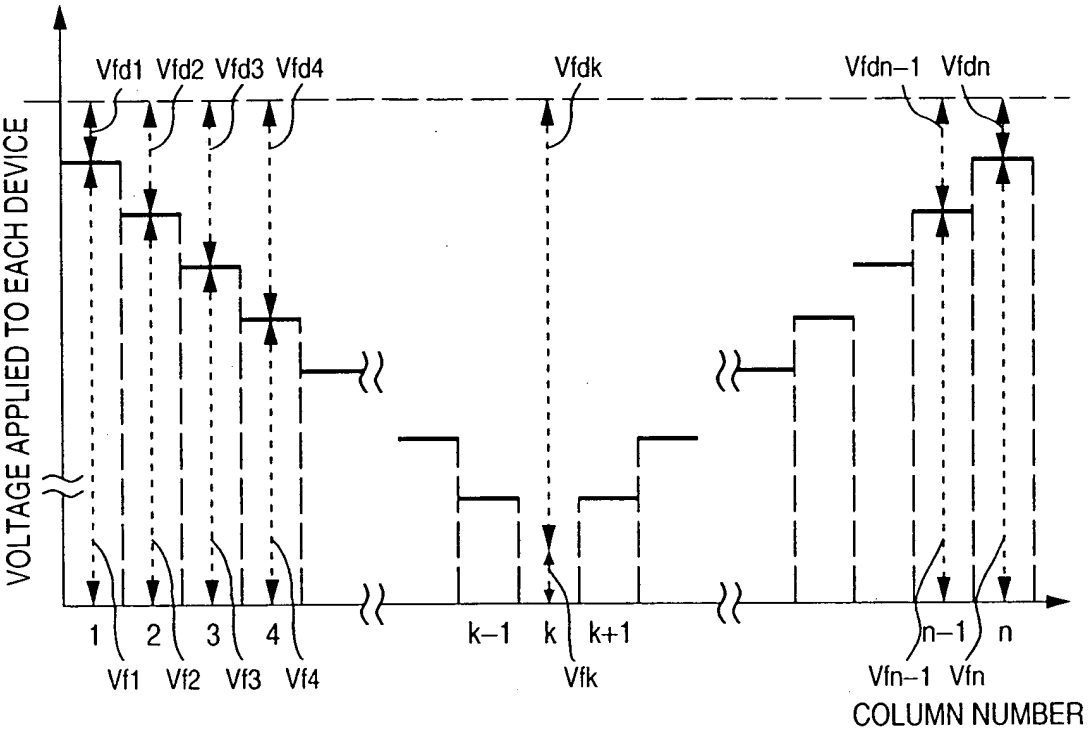



FIG. 29B

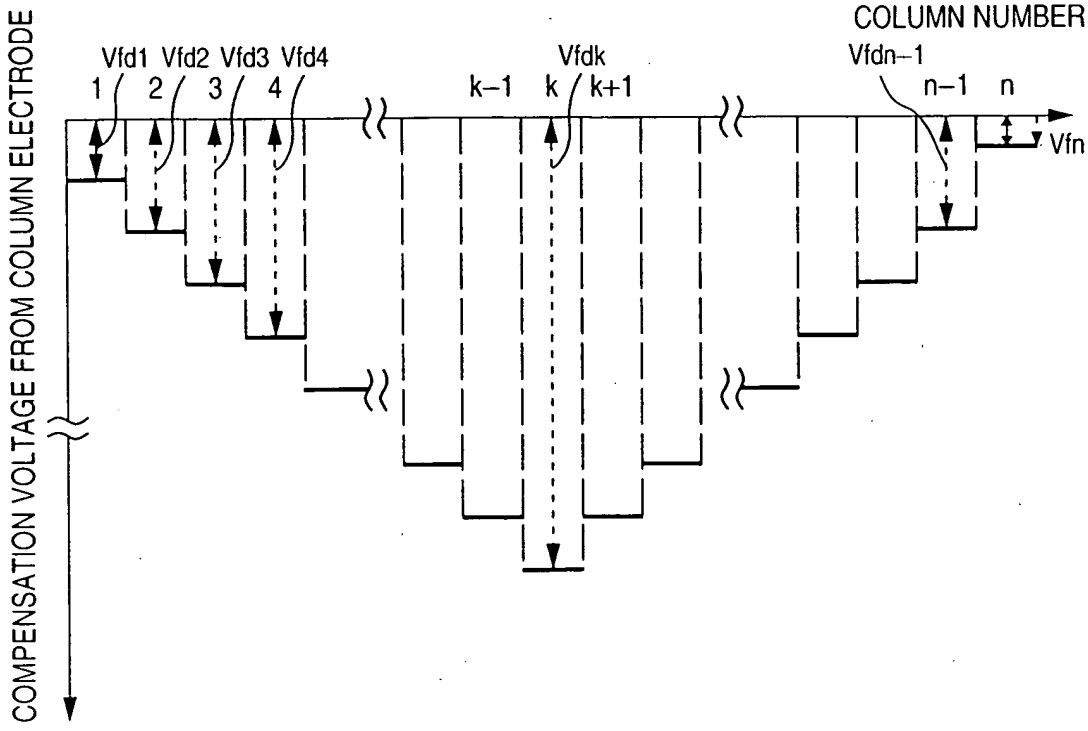


FIG. 30

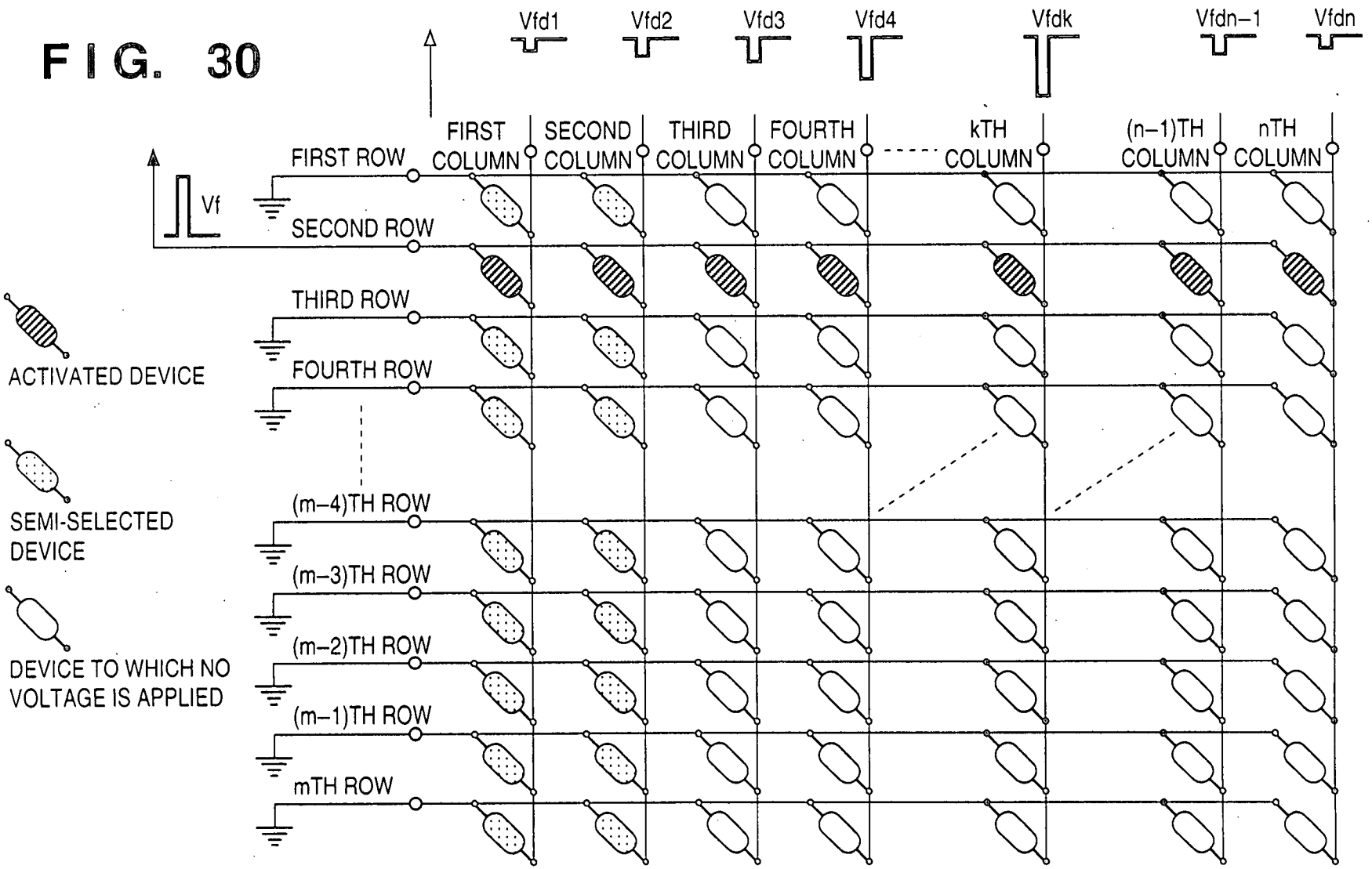
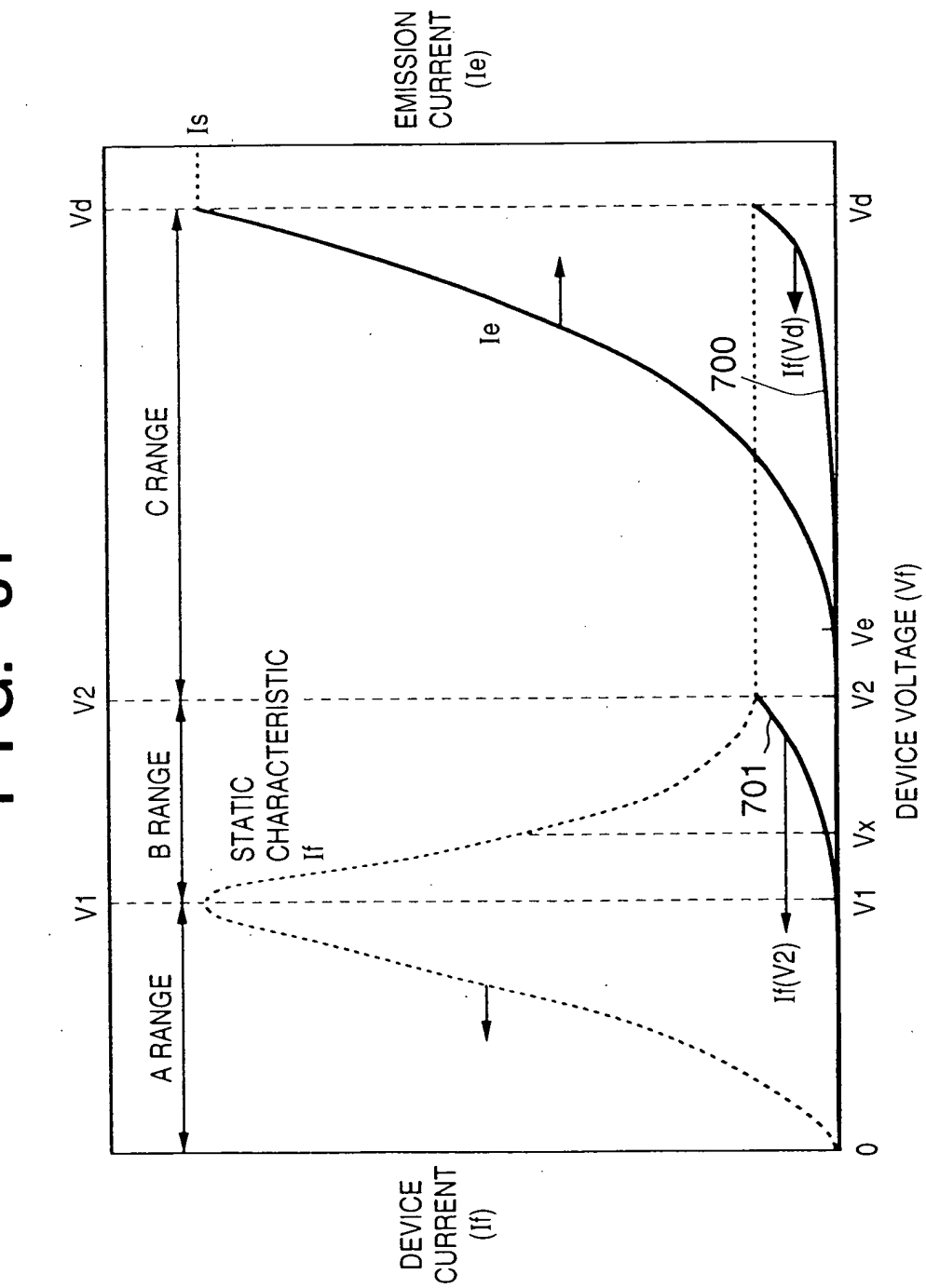

Vfd1
Vfd2
Vfd3
Vfd4
Vfdk
Vfdn−1
Vfdn
FIRST COLUMN
SECOND COLUMN
THIRD COLUMN
FOURTH COLUMN
kTH COLUMN
(n−1)TH COLUMN
nTH COLUMN
FIRST ROW
SECOND ROW
THIRD ROW
FOURTH ROW
(m−4)TH ROW
(m−3)TH ROW
(m−2)TH ROW
(m−1)TH ROW
mTH ROW
Vf
ACTIVATED DEVICE
SEMI-SELECTED DEVICE
DEVICE TO WHICH NO VOLTAGE IS APPLIED

FIG. 31


EMISSION CURRENT (Ie)
Is
Vd
C RANGE
V2
B RANGE
V1
A RANGE
STATIC CHARACTERISTIC If
Ie
700
If(Vd)
701
If(V2)
Ve
Vx
0
DEVICE VOLTAGE (Vf)
DEVICE CURRENT (If)